

Information For DIME Tier I & II Teams

Here is design guidance as the teams begin their design and fabrication process.

If the team members have not already done so, they should familiarize themselves with the Experiment Design Requirements document. That document contains the guidelines, requirements, and constraints for designing a DIME experiment to successfully operate in the 2.2 Second Drop Tower. A PDF version of the document can be found on-line from the DIME home page at:

<http://spaceflightsystems.grc.nasa.gov/DIME.html>

Another source of information about microgravity and the drop tower is this TeacherTube video at:

http://www.teachertube.com/viewVideo.php?video_id=97102

There are several steps during the design and building phase of the DIME program. The DIME teams will prepare a 'design package' and submit it to NASA for review. A safety package will also be prepared and submitted by the team. This information will be used primarily for assessing the safety of the experiment. The NASA staff will also examine the design for potential problems that may hinder or prevent the experiment from being operated in the drop tower. After review, the NASA staff will provide feedback to the team for any problems or issues. The contents of a design package are included at the end of this information.

In December and January, the team does the detailed design of their experiment. This includes the electrical and mechanical design culminating in a Preliminary Design Package at the end of January. This package contains the design details that are known or planned at that time. Particular attention should be paid to the DIME Experiment Design Requirements document that specifies many of the details of the experiment design, such as maximum size and weight.

The Preliminary Design Package will be refined into a Final Design Package that will be due with the delivery of the experiment hardware at NASA. These design packages and the experiment apparatus itself will be used by a NASA safety panel to determine whether or not the experiment may be operated in the drop tower facility. The NASA staff may also offer advice or corrective actions for the experiment.

The dates for these submissions are listed below. Paper copies of the submissions should be mailed to:

DIME / Mail Stop 77-7
NASA Glenn Research Center
21000 Brookpark Road
Cleveland, OH 44135

If you prepare an electronic file, you can send the file or files as attachments to an e-mail addressed to dime@lists.nasa.gov

For ease in reading the files, please send in a PDF format. Such files can be created by SAVING AS or PRINT AS PDF in popular computer applications.

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FEBRUARY 1

- Submit a Preliminary Design Package to NASA
- Submit safety package information to NASA

MARCH 1

- Deliver experiment to NASA Glenn Research Center, Cleveland, Ohio.
NASA Glenn Research Center
Attn: Nancy Hall
Bldg. 45, Shop
21000 Brookpark Road
Cleveland, OH 44135
- Tier I teams only: Submit photograph release forms (one per student and advisor) to NASA. Blank forms will be sent by NASA.
- Tier I teams only: Submit to NASA the list of team members' names (up to four students and the adult advisor) who will travel to NASA Glenn for DIME Tier I Drop Days in March. Keep in mind all such visitors must be U.S. citizens.
- Tier II Advisors only: Submit photograph release form to NASA. Blank form will be sent by NASA.
- Tier II Advisors only: Submit to NASA the name of the advisor who will travel to NASA Glenn for DIME Tier II Drop Days in March. Keep in mind all such visitors must be U.S. citizens.

MARCH 15 - 17 **DIME TIER II DROP DAYS**

- Tier II Advisors only: Bring a driver's license (preferred) or another state-issued picture ID.

MARCH 21-22 or 24-25 **DIME TIER I DROP DAYS**

- Tier I teams only: Bring a driver's license (preferred), school ID (if no drivers license), or another state-issued picture ID.

APRIL 15

- Submit final report to NASA
 - All teams: The final report should include the hypothesis from your proposal, a data summary, an analysis of the data, conclusions, and an assessment of the hypothesis based on the experiment results.

In January, NASA will send a base plate to each DIME Tier I & II team. The team will build their experiment on this base plate that will help ensure the team's experiment will fit in the drop tower equipment at NASA. The base plate is an aluminum plate 12"x12"x0.5" with 144 threaded holes. See Section 6 of the Experiment Requirements Document (obtained from the DIME web site) for a more complete description of the plate. The holes allow common 1/4-20 bolts to be used to hold components of the experiment. A thread tap will also be sent with the base plate to facilitate cleaning paint out of the base plate holes (as needed).

If a team requires electrical connections to the NASA Education Rig, the appropriate connectors will be supplied by NASA to ensure compatibility with the Education Rig.

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CONTENTS OF THE DESIGN PACKAGE

Science

Provide some material from your team's proposal to summarize the science aspects of the experiment. Include a one or two sentence summary of the hypothesis or research objective. Indicate the range of samples and/or conditions during testing. Identify explicitly what measurements will be made to verify the hypothesis or to answer the team's research question.

Drawing

Provide a detailed, labeled drawing of the apparatus as mounted for operations on the NASA-provided Mounting Adaptor Plate. Dimensions (with units) and locations of the major components should be shown. Include the Mounting Adaptor Plate in the drawing.

Materials

A list of materials with type and quantity (and/or thickness) for all experiment components must be included. Don't forget the sample materials (if any) of the experiment, such as salad oil or ginger ale fluid.

Hazardous Materials

A list of materials with type and quantity (and/or thickness) for all chemicals used must be included. Identify what (if any) chemical reaction products are created. If there is a question about the acceptability of a particular material or chemical reaction product, discuss it with your team's NASA mentor right away rather than waiting to include it in the design project.

Fasteners

Indicate the size and type of fasteners (e.g. bolts, nuts, and screws) to be used in the construction of the major components. Bear in mind the Mounting Adaptor Plate has standard 1/4-20 threaded holes. Fastener size is a concern for the integrity of the experiment when it "hits bottom" in the drop tower. Pieces of the experiment that may break could damage NASA equipment.

Fluids

Describe how fluids are contained within the experiment apparatus.

Survival

Describe design features that ensure survival of apparatus after impact of repeated drops.

Please describe how you provide secondary containment for your fluids in case of a leak in the primary container.

Mass

Prepare a table with the mass (use consistent units) of all components of the experiment apparatus. This table should include all experiment fluids, samples, wires, connectors, Mounting Adaptor Plate, etc. Ensure that the total mass is less than the limit specified in the DIME Experiment Requirements Document.

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Procedure

Provide a step-by-step procedure to prepare your team's experiment apparatus for a drop in the drop tower during DIME Drop Days. This should include the steps necessary to initially prepare the experiment in a laboratory as well as any steps immediately before the experiment is dropped. In addition, any action needed AFTER the experiment is released to fall should be included in this procedure. The DIME Educational Rig, which is used to carry the experiment, has a time delay relay that may be used to initiate an action at an adjustable time after the experiment is released in the drop tower. See the DIME Experiment Requirements Document for more details. The steps necessary to recover the data from the experiment after the drop is complete should also be included.

While we realize the team is not really familiar with the drop tower operations, the point of this requirement is to make a team think about the steps involved in preparing the experiment for operations, what the experiment has to do during microgravity, and what has to be done to the experiment to ready it for another drop.

Electrical Diagram

If your experiment has an electrical devices, provide an electrical circuit diagram of your experiment with identification of each component. Include wire sizes (i.e. wire gauge) and fuse sizes. Ensure adequate length of cable to the power connectors (see the DIME Experiment Requirements Document). The electrical connectors that plug into the Educational Rig are provided by NASA. All other electrical components are to be supplied by the team.

Time Delay

If the time delay relay will be used, specify the required time delay, which can be from 0.1 second to 102.3 seconds in 0.1-second increments.

Data Logger

Specify the connections to the (optional) electronic data logger for the analog and/or digital signals.

Additional Information

Optional information can be added to further illustrate the design. Photographs of prototype and/or finished equipment may be included. Results of testing done at the team's home location may be included.

Questions?

If you have any questions, please don't hesitate to ask the NASA DIME staff.

First choice should be your mentor.

Using e-mail, send your question to: dime@lists.nasa.gov

You may telephone Nancy R. Hall, the NASA Project Manager, at 216-433-5643.